Effects of the management on tree-ring growth of *Pinus pinaster*

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Introduction and Regional Setting

Pinus pinaster Spanish distribution (Alcalde et al. 2004), sampling site and trees location

Pinus pinaster is the pine forest species who occupy the major extension in the Iberian Peninsula. His ecological versatility enable it inhabit successfully on diverse ecosystems in a wide range of substrates and climates. Moreover, this species traditionally has been subjected to intensive use as the extraction of resin and wood. All of this makes a great aptitude of providing abundant and diverse growth data from trees in different ecological situations.

The site studied is located in in the middle Duero basin in the transition to the Central System (Moral Hornuez, Segovia), 3º37´-3º40´ W, 41º29´-41º27' N, on a Triassic sandstones, conglomerates and clays, with very well drained soils, 1120- 1300 m above sea level. Climate is Mediterranean, characterized by irregular rainfall, between and within years, and high summer temperatures.

The resin extraction had been an important activity in the area since ancient times, although it was finally abandoned in 1982.

Moreover, this pine forest has been managed primarily through regenerative felling, although there has been no major since 1954, leaving aside exceptional felling such as 1972-1982 or 1992 (4ª Revisión del Proyecto de Ordenación, 1993-2002), the year in which the greatest cutting took place.

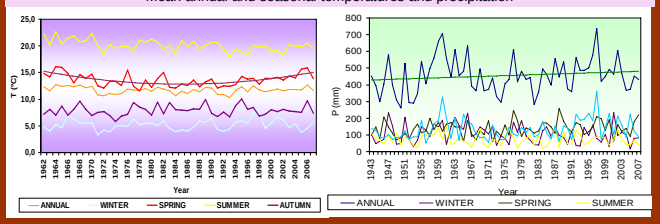
Materials and Methods

We analyzed 59 tree-ring cores from 29 trees, both dominant and codominant, resined and no resined trees, all in good physical condition. Between them, 40 growth series were selected, which are those we have enough information to make an analysis of the variability.

The analysis included studies by age classes and by degrees of to extract resin, determining pointer years, releases and suppressions, general growth trends and its relationship with environmental and anthropic factors.

Meteorological data used comes from Linares del Arroyo, the nearest station to the site.

Mean annual and seasonal temperatures and precipitation



Especially, we detected in this meteorological record a moderate increase of average spring temperatures since the 90s of the twentieth century and a two periods of higher than usual rainfall: 1956-1967 y 1992-2003.

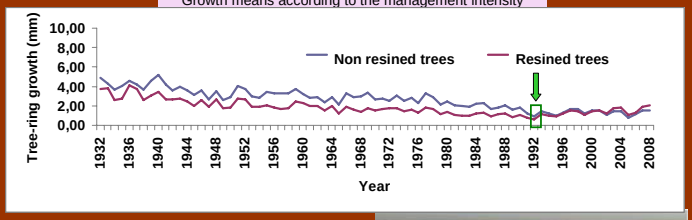
Future perspectives

Unfortunately, the region has suffered a serious fire in the summer of 2008, when the entire study area has been affected. On many dead trees we cut into slices, their analysis increased and outline this study in the near future.

Results and Discussion

So far, only we have identified the effect of resin extraction analyzing the average values of non resined and resined tree growth, the latter being significantly lower. Furthermore, once the resin extraction is abandoned, the resined trees require a time interval (between 10 and 20 years) to recover their vigour.

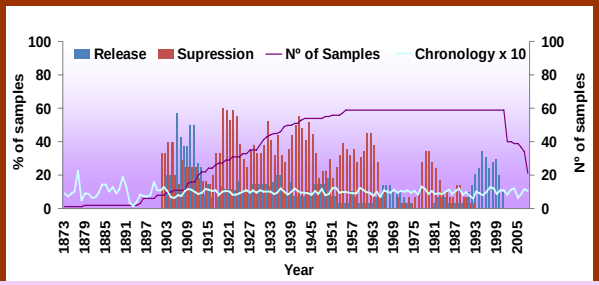
Growth means according to the management intensity



Core portion showing trend change

In addition, all studied trees show a trend change from the pointer year 1992, towards a moderate increment in annual growth (see the release period determined on 90s).

This favourable change can be attributed to several factors. In terms of managing, the latest and extensive cuttings have led to reduced competition and no resin is extracted in recent decades. Other factors, such as an increased spring temperatures and precipitation since the 90s, are also positively affect the increased growth (Caminero 2009), such as in other Spanish *Pinus pinaster* forest (Bogino & Bravo 2008).



As the resin extraction did not alter the general short wavelength variability, we developed a local chronology (1873-2008) with all synchronized series, to use in future work.

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"History and Dynamics of the Vegetal Landscape" Research Group

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